Research Article

Physiology Section

The Comparision of the **Motor Nerve Conduction Velocity** in the left and right **Upper Limbs** in normal right handed subjects

HARINDER JOT SINGH, RAJIV ARORA

ABSTRACT

The nerve conduction velocity depends upon age, temperature, nerve diameter and myelination. The nerve conduction velocity was performed on 50 normal right handed subjects with a matched number of males and females by using a Neuroplus EMG/ NCV Electrophysiology machine at the Punjab Institute of Medical Sciences, Jalandhar. Subjects with compression neuropathy, numbness or any nerve injury were excluded from study. The motor nerve conduction velocity was performed on the left and right hands in the median nerve and in the ulnar nerves and the data was analysed statistically. The motor nerve conduction velocity was greater in the right limb as compared to the left limb both in the median nerve and the ulnar nerve although the difference was not statistically significant. However, the latency of the median nerve of the right upper limb was less than that of the left upper limb with a significant difference.

Key Words: Nerve conduction velocity, Latency, Amplitude

INTRODUCTION

The nerve conduction study (NCS) is a test which is commonly used to evaluate the function, especially the ability of the electrical conduction, of the motor and sensory nerves of the human body. Nerve conduction velocity (NCV) is a common measurement which is made during this test. In the peripheral nervous system, the nerve fibres of various diameters and functions (motor and sensory) are bundled together by the connective tissue to form nerves [1].

A compound action potential is the sum of all the action potentials which occur in the individual neurons of the whole nerve. The velocity of the compound action potential signal can be a measure and can indicate the state of health of the nerve. Diseases that damage the myelin, destroy neurons, or constrict the whole nerve will decrease the nerve's conduction velocity. However, the nerve conduction velocity may remain normal until late in a disease process. In addition, the nerve conduction velocity reflects the conduction of the fastest nerve fibres, usually the motor neurons. A nerve conduction velocity test measures as to how quickly the electrical impulses move along a nerve.

The nerve conduction velocity depends upon age, temperature and parameters like nerve diameter and myelination [2].

It is a diagnostic tool for various neuropathies. The nerve conduction velocity is the speed at which an electrical stimulus passes through the nerves. The motor nerve conduction velocity (MNCV) is performed by the electrical stimulation of a peripheral nerve and by using the recording from a muscle which is supplied by this nerve. The time it takes for the electrical impulse to travel from the stimulation site to the recording site is measured. This value is called the latency and it is measured in milliseconds (ms). The size of the response called the amplitude is also measured. The motor amplitudes are measured in millivolts (mv).

MATERIAL AND METHOD

The Nerve conduction velocity was performed on a Neuro perfect 2- channel EMG NCV Electrophysiology machine in the Physiology Department of our institute. Written consent was taken from each subject. The subjects who had abnormal numbness, a tingling sensation or neuropathy were excluded from the study. In this study, the motor nerve conduction velocities (MNCV) of the median and the ulnar nerves in the left and right upper limbs were compared in 50 right handed subjects of ages between 21-25 years, with a matched number of males and females. The subjects were recruited from the Punjab Institute of Medical Sciences, Jalandhar. Our aim was to show the effect of the cerebral dominance on the motor nerve conduction velocity.

The latency was measured from the stimulus artefact to the first negative deflection from the base line. The temperature of the limb was kept at 35-40° C. The distances were measured by using a standard measuring tape. The compound muscle action potential was recorded by using surface electrodes which were in the form of small discs. They were fixed to the skin with jelly by using adhesive tapes. The active electrode was placed on the muscle belly at the motor point and the indifferent electrode was placed on the tendon. After recording from each stimulation site, the latency was measured from the stimulus artefact to the first negative deflection from the baseline. The distance was then measured between each stimulation point from the cathode stimulation point to the cathode stimulating point. The conduction velocity of that nerve was determined in m/sec by dividing the distance between the two stimulation points by the latency difference of the related response [3], [4].

The conduction velocity was then determined by using the following formula:

Conduction velocity = Distance (mm) / proximal latency - distal latency (in milliseconds).

MACHINE SETTINGS

For the motor nerve studies, the sweep speed was 5 ms, the sensitivity was 3 mv, the low frequency filter was 2Hz and the high frequency filter was 3 KHz. The stimulation was done by using a supra maximal technique by using a wave of 0.1ms and the distances were measured with a standard tape in millimeters. The nerve conduction velocity was calculated by dividing the latent period by the nerve length. The following data of the left and right upper limbs were compared for each nerve.

1. Motor nerve conduction velocity (MNCV)
2. Latency
3. Amplitude

We studied the motor nerve conduction velocity of the median and

the ulnar nerve of the right and left upper limbs. The results were expressed as mean ± standard deviation and the data was analysed by using the Student's unpaired "t" test.

DISCUSSION

Our study shows that the motor nerve conduction velocity was greater in the right limb as compared to the left limb for both the median nerve and the ulnar nerves, though the difference was not statistically significant. Our study also demonstrated that the latency of the median nerve of the right upper limb was less as compared to that of the left upper limb, with significant difference. [Table/Fig 1].

Median nerve	Mean ± S.D.		
Parameters	Right hand	Left hand	Significance
NCV (m/s)	58.70 ± 5.98	57.78 ± 4.67	Not Significant
Latency (ms)	2.55 ± 0.86	2.92 ± 0.4	Significant
Amplitude (mv)	13.48 ± 6.12	13.12 ± 4.22	Not Significant

[Table/Fig:1] the latency of the median nerve of the right upper limb was less as compared to that of the left upper limb

The difference in the sizes of the motor neurons of the 2 limbs can be the reason for the difference in the conduction velocity. The motor neurons of the spinal cord of the right upper limb were more as compared to those of the left upper limb. (5).

The latency of the left ulnar nerve was more as compared to the latency of the right ulnar nerve, but on applying the test of significance, it was found to be statistically not significant [Table/Fig 2].

Ulnar nerve	Mean ± S.D.		
Parameters	Right hand	Left hand	Significance
NCV (m/s)	61.65 ± 6.25	61.35 ± 6.7	Not Significant
Latency (ms)	2.45 ± 0.21	2.58 ± 0.39	Not Significant
Amplitude (mv)	8.89 ± 2.43	8.76 ± 2.29	Not Significant

[Table/Fig:1] latency of the left ulnar nerve was more as compared to the latency of the right ulnar nerve

The latency of the left median nerve was significantly more as compared to that of the right median nerve (Table I). So, the latency was found to be greater in the left limb as compared to that in the right limb. The association between handedness and amplitude has not been studied in detail.

A previous study which was conducted by Navin Gupta, Sharmila Sanyal and Sashmi Babbar demonstrated no significant difference in the motor nerve conduction velocity (MNCV)in the right and left limbs. The MNCV was also the same in the left and right limbs as was observed in a study which was conducted by Tan U [6].

Our results were at variance with the findings of the study which was conducted by Pardaman Singh, B.K.Maini and Inderbir Singh (1977), where they found that the conduction velocity was faster on the right side in right handed persons as compared to that in the left limb in right handed persons [7].

Nevertheless, the findings of our study were in concordance with a study which was conducted by Seema Bhorania and Rati B. Ichaporia, where they found that there was no significant difference in the velocity between the dominant and non dominant limbs of the same individuals, but that the nerve conduction velocity in the right handed subjects was more as compared to that in their counterparts [8].

RESULTS

We therefore conclude that the motor nerve conduction velocity did not show a significant difference when compared to that in the right and left upper limbs of the same individual. Also, limb dominance did not have any significant effect on the motor nerve conduction velocity of the upper limbs.

REFERENCES:

[1] Sandham JD. Nerve Conduction Velocity (NCV) Test. (Online). (Pages 6) . Available from:URL;http;//www.ebme.co.uk/arts/emg/1.
[2] Navin gupta, Sharmila sanyal and Sashmi babbar. Sensory nerve conduction is greater in Left handed persons. Indian j physiol pharmacol 2008; 52(2): 189-92.
[3] Misra UK, Kalita J. Nerve Conduction Study. In: Misra UK, Kalita J, eds. Clinical Neurophysiology. New Delhi, Elsevier 1999; 25–28.
[4] Buschbacher RM. Ulnar nerve motor conduction to the abductor digiti minimi. Am J Phys Med Rehabil 1999; 78: S9–S14.
[5] Melsbach G, Wohlschlager A, Spiess m, Gunturkun o. Morphological asymmetries of motor neurons innervating upper extremities. Clue to the anatomicalfoundation of handedness. Int J Neuroscience 1996; 86: 217-24.
[6] Tan U. Velocities of motor and sensory nerve conduction are the same for right and left arms in right and left handed normal subjects. Percept Mot Skills 1985; 60: 625–26.
[7] Singh PI, Maini BK, Singh I. Bilateral asymmetry in conduction velocity in the efferent fibres of the median nerve and its relationship to handedness. Ind J Physiol Pharmacol 1977; 21: 364–368
[8] Seema bhorania* and Rati b. Ichaporia. Effect of limb dominance on motor nerve conduction. Indian j physiol pharmacol. 2009; 53 (3) : 279–282

AUTHORS:

1. Dr. Harinder Jot Singh
2. Dr. Rajiv Arora

NAME OF DEPARTMENT(S) / INSTITUTION(S) TO WHICH THE WORK IS ATTRIBUTED:
Dept of Physiology, Punjab Institute of medical sciences, Jalandhar

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Dr. Harinder Jot Singh, Department of Physiology, Punjab Institute of medical sciences, Jalandhar
Email Id: drharinderjotphysiology@yahoo.co.in

DECLARATION ON COMPETING INTERESTS: No competing Interests

Date of Submission: **Nov 29, 2010**
Date of Acceptance: **Dec 22, 2010**
Date of Review: **Jan 25, 2011**
Date of Publication: **Apr 11, 2011**